

ASPECTS OF MANAGERIAL CONTROL IN
ROAD TRANSPORT OPERATIONS

by

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CHAPTER ONEINTRODUCTION

1.1 PREFACE

The Road Transport Industry has, by and large, escaped the attention of the academic researcher and the literary writer. That work which has been forthcoming, has tended to be of a generalized nature in that the most important ingredients of a road transport company have always been mentioned, but seldom discussed in any depth. This is particularly the case in South Africa where there are only two firmly established academic writers on Road Transport. These are Dr. J. J. Burger and Dr. C. Verburgh.

The intention behind this dissertation is to make a contribution towards closing the gap between those aspects of a transport company that have always been mentioned and those that have been reviewed in some depth. The following three areas are discussed:

- (a) fleet size
- (b) the cost structure and influencing factors
- (c) control information.

These three subjects form the basic knowledge requirements for any road transport business, and have a major influence on the success or failure of that business.

The method adopted for the discussion takes account of the fact that no two businesses are likely to encounter the very same

environments or the same set of circumstances. Each business must, therefore, be considered in the light of its own situation. As a result, the discussions are primarily aimed at stimulating the thoughts of the reader in his own set of circumstances rather than to supplying clear-cut solutions to specific problems applicable to all companies.

1.2 MANAGERIAL CONTROL

Managerial control involves the following exercise:

- (a) the establishment of performance standards
- (b) the measurement of actual performance
- (c) the evaluation of actual performance
- (d) the taking of any necessary corrective action.

Arnold J. Emch ⁽¹⁾ has the following to say on 'control'

'Control is being exercised when the operations of the enterprise are guided within the plans adopted, are held in line in the face of varying conditions, or are returned to an in-line state after deviations are located. Note that action is implied in each case. This is important. In a very real sense, control means action - action to correct a condition found to be in error, or action to prevent such a condition from arising - and is never achieved without having action as an essential step'.

Further on Emch makes the following statement: '....., control can be as much an energizing as a steering function. So conceived it should no longer be a barrier but a tremendous boon to initiative'. Thus, the function of controlling a company's affairs is seen in a positive light and an opportunity to take advantage of new and changed situations.

It is not seen as being negative in that it means applying constraints on areas of the business that are not coming up to expectations.

1.3 AREAS OF CONTROL

The three previously mentioned areas of control have been selected as they are basic to the sound running of any road transport business. The control has to start here before other areas can be meaningfully controlled.

1.3.1 Fleet size

George A. Hughes⁽²⁾ makes the following statement on fleet size:

'It is not often that a firm has to plan its transport fleet without some previous experience. Usually there is already a fleet in existence. When this is the case, intelligent scrutiny of requirements in detail should lead to a staged reduction or staged increase in the fleet in order that at each stage a check may be made of the results. In this way there is a chance to verify the correctness of the action.

Let there be no illusions. If an overlarge fleet of vehicles is provided it will be used. An overlarge fleet will make life easier for many people. It will not maximise profit'.

Very much along the same vein R.G. Basset⁽³⁾ says:

'Many transport operators carry out their daily task of delivering goods to various points up and down the country, and if

purchase some of their vehicles are idle for part of the time it is put down to lack of orders or poor utilization. Little do they realize that they should gear capacity to demand, rather than maintain a fleet of vehicles just because they have always had vehicles of that quantity, weight, and class. Consequently it is easy to have too many vehicles employed. A smaller fleet of the 'right size' could earn a higher return on the capital employed'.

It is clear from these two quotes that the determination of the optimal fleet size plays an important part in the final analysis of the success or failure of a transport business. This topic therefore is dealt with in some detail in chapter three.

1.3.2 Cost structure and influencing factors

The importance of keeping historical cost records and attempting to anticipate changes in future costs are emphasized by R.G. Basset⁽⁴⁾ when he states:

'It is a fact of life,, that where a cost-accounting system is employed, *and* used, a business has a much better chance of survival. This is because unfavourable trends are at once brought to light so that management can take corrective action. Put another way, costing by itself solves nothing, but it does present management with facts and relevant information which enables them to make more accurate decisions. In short, it helps them to manage a business more effectively by not leaving the most important side of the business - the financial side - to run its own course!

Overall financial control is achieved by monitoring the individual cost components that go to make up the total cost and revenue

structures of the company. Only the cost structure will be reviewed here since the revenue side is largely a matter of management policy and therefore somewhat arbitrary, whereas the cost structures between transport businesses do bear some distinct similarities. This is because most of the cost components are common to all transport enterprises. The accumulation of these cost components into a structural formula is referred to as 'costing'.

R.G. Basset⁽⁵⁾ defines 'Costing' by saying:

'The term 'costing' as used here is really an abbreviation of the more descriptive name 'cost accounting'. Put very simply, cost accounting traces costs to causes and is primarily concerned with the effective use of resources - materials, men, machines, and money. This concept should never be lost sight of because that is what costing is all about. Costing records, traces and measures. In a road haulage firm (or transport department) costs and profits are analysed over vehicles (or groups of vehicles), depots and internal departments. It shows 'at a glance' where profits and losses are being made and where management action is needed.

A business without a costing system has been likened to a ship without a compass and a lighthouse without a lamp'

How does a company keep control of its costs?

Dr. J.J. Burger⁽⁶⁾ makes the following statement:

'It is not so much a question of keeping a lot of new books as it is of reorganizing the existing accounting system in such a way that with very little additional effort it shows the cost and revenue

figures in a disciplined way, in the sense that the results fall nearly automatically in the pattern of individual vehicles and vehicle groups, and of separate operations'.

The organisation of costs as they relate to the Road Transport Industry into cost centres will be discussed in chapter four, highlighting the factors which are likely to influence the extent and stability of each cost centre. This is an essential step if costs are to be allocated, measured and their performance analysed against pre-determined performance standards either in the form of budgets or job costings.

1.3.3 Control information

The need for control information is outlined by Henry B. Cooley⁽⁷⁾ when he states:

'To function properly, management must know what is going on in the business, and its main source of information must be the reports which it receives from the various departments. Like other supervisory personnel, the members of the managerial staff are merely individuals, and their own observations can cover only a limited amount of the many details involved in the usual operation of the business. They must depend upon reports and records for their information. To the extent that these are properly designed and furnish the necessary information in an accurate manner, and to the extent that the management utilizes the information so made available, management will have the necessary information concerning the operations of the business to formulate policies and to see that these policies are executed'.

Emphasizing the same importance of control information, Dr. C. Verburgh⁽⁸⁾ states:

'In Western Europe, it is also found that the transport manager does not always have sufficient records kept in order to enable him to know exactly how his vehicles are performing and what his staff is putting out. He is largely groping in the dark when it comes to controlling the operations and deciding when a vehicle must be replaced and what is required in respect of the new vehicle. And yet, when proper records were kept and sensible standards set, it was amazing to notice not only how performance went up and costs down, but also how the morale of the staff improved. The reason for the latter was firstly, that a spirit of competitiveness was introduced in the maintenance and the running of the vehicles, and secondly, even more important, that the staff now know where they stood because they had a certain goal to which to work. In the past they may have been reprimanded severely when the manager did not consider performance to be up to expectations, but this was often rather unfair because the staff had only a very limited knowledge of what these expectations were'.

The exact nature of the control information required in controlling a road transport operation is gone into in some depth in chapter five of this study, with the accent being on what information is required, where it is derived from and how it relates to the overall control situation.

1.4 OBJECTIVES

The specific objectives of the individual sections of this dissertation are as outlined below.

1.4.1 Fleet size discussion

Specific objectives for this section are:

- (i) To determine the factors which influence the optimal size of the fleet.
- (ii) To find out which of the abovementioned factors are within the control of the company.
- (iii) To highlight differences in the calculation method for determining the optimal fleet size which are the result of the factors mentioned in points (i) and (ii).

1.4.2 Cost structure and influencing factor discussion

Specific objectives for this section are:

- (i) To determine the most meaningful cost centres applicable to a road transport operation.
- (ii) To determine the most significant variable cost centres in terms of monetary value amongst a sample of different types of road transport.
- (iii) To determine the extent to which each cost centre is
 - (a) predictable,
 - and
 - (b) controlled by the company.

1.4.3 Control information discussion

Specific objectives for this section are:

- (i) To outline the basic requirements for an effective and efficient control system.
- (ii) To determine what control information is required in the management of a road transport business (or department).
- (iii) To integrate the control information into an overall company control context.

CHAPTER TWOMETHODOLOGY

2.1 INTRODUCTION

This chapter serves to outline the method used to research for this study, and the reasons for the choice of these methods.

2.2 THE STAGES INVOLVED IN THIS STUDY

Various steps which were undertaken as the theme of this study progressed are listed below in the order in which they occurred.

2.2.1 Transport types

A sample of different types of road transport currently used in South Africa was selected.

The differences between transport types come from the fact that companies employing such forms of transport operate in markets with differing characteristics. The physical and chemical nature of the products being carried, the handling methods that can, or have to be used for such products, and the market environment itself, impose constraints on the road transport operator to such a degree that it is rare to find two operations that are identical. A summary of each transport type appears in exhibit 6.

2.2.2 Transport type characteristics

The characteristics exhibited by each of the types of transport selected were tabulated as shown in exhibits one to four under the headings of 'market', 'product', 'place' and 'vehicle' characteristics. Each heading is divided into a number of sub-headings aimed at highlighting specific differences between transport types. The sub-headings are defined in exhibit 5.

It should be noted that selected products have been chosen for each type of transport. This has been done to illustrate more effectively the differences between market characteristics and is in no way meant to detract from the validity of this study.

2.2.3 Market forecasts and vehicle requirements

A general discussion on the common methods available for forecasting future market volumes was undertaken as a basis on which to discuss the calculation of the number of vehicles required to accomplish a given amount of work. The vehicle requirement analysis is done with special reference to the types of transport selected in 2.2.1.

2.2.4 The costs involved in road transport

Following the same pattern as in 2.2.3, a general discussion on the major cost centres occurring in road transport was undertaken outlining, not only the cost centres, but also the factors that influence each cost centre. This discussion leads into a comparison of the relative importance of each of the variable cost centres for the chosen transport types, and the reasons for differences in relative importance.

2.2.5 The control of performance

Various factors influencing the control of a road transport operation were discussed. Initially, relevant statistical information, and the management thereof, was looked into with the view to looking at relationship between the data and the use of specific control relationships.

These control relationships were then reviewed in the context of the selected sample of transport types.

2.2.6 Conclusions

Finally, all the conclusions arrived at in the previously mentioned sections were presented in a summarized form.

2.3 METHOD USED FOR GATHERING INFORMATION

Information was gathered entirely by means of informal interviews with the management of firms operating the types of transport selected for this study. This was done in the Durban area only for economic reasons.

2.3.1 The reasons for the choice of informal interviews

- (i) this method offered better in-depth potential than a structured questionnaire allowing the interviewer to probe 'grey areas' particularly relating to the areas of discussion in this study.
- (ii) the interviewer was in a better position to separate fact from fiction.
- (iii) personal interviews, it was felt, would get a better reception from the management of interviewed companies. A questionnaire would, more often than not, be filled in by lower or middle management, thereby lowering the standard of this study.

- (iv) the accounting system of most firms differ so much as to make any direct comparison invalid. Interviews highlighted differences in accounting methods and enabled adjustments to be done before comparisons were made.
- (v) the number of operating companies in certain of the types of transport selected in this study is small, therefore making it important to double check on statements made by interviewed companies.

2.3.2 The reasons for the choice of transport types

- (i) they would provide specific 'case studies' which would stand up to in-depth analysis.
- (ii) the examples taken are real.
- (iii) the complete spectrum of specialized to unspecialized work is reflected in the choice.
- (iv) Several *large* companies operated the types selected, thereby improving the credibility of the information collected.
- (iv) all of these operations existed in the Durban area.
- (vi) the examples chosen each exhibit interesting characteristics which are unique to that type of transport.

2.3.3 Assumption made in the gathering of information

For the purpose of this discussion, it was assumed that all companies being interviewed as well as all transport types experienced the same standard of management, drivers and maintenance.

2.4 PATTERN OF DISCUSSION

The format adopted for all discussions was to have an overall look at an area of road transport using a general frame of reference initially, and finishing with a more specific look at that same area as it relates to the sample transport types selected in this study.

2.5 PURPOSE OF STUDY

The purpose of this dissertation is primarily to look into some of the qualitative aspects of road transport as opposed to the quantitative aspects. The emphasis, therefore, is on method rather than the results themselves.

In the discussions, the writer hopes to provoke thoughts rather than find solutions. Whatever thoughts are activated, will still have to be matched with the circumstances surrounding a particular company.

CHAPTER THREEMARKET FORECASTS AND VEHICLE REQUIREMENTS

3.1 INTRODUCTION

In this chapter the information on which future capacity requirements are based will be discussed.

The first section takes a look at the methods of obtaining information on future volumes of traffic, pointing out some of the hazards of each method. This is intended to be a brief look at a very large subject only.

The second and third sections are combined and look at:

- (a) a general method of extending the projected traffic volumes into the number of vehicles required to move these volumes, and
- (b) differences that arise in using this method on the sample of transport types selected.

3.2 VOLUME OF TRAFFIC

It is necessary before one can start trying to estimate costs, to determine as accurately as possible, the volume of goods to be transported, and where these goods have to be transported to. Without this information, cost estimates are either impossible or at least, highly suspect.

Peter Drucker⁽⁹⁾ has the following to say:

'Predictions concerning five, ten or fifteen years ahead are always 'guesses'. Still, there is a difference between an 'educated guess' and a 'hunch', between a guess that is based upon a rational appraisal of the range of possibilities and a guess that is simply a gamble'.

How does one obtain a rational appraisal of the range of possibilities when trying to predict future volumes of traffic?

3.3 SOURCES OF INFORMATION ON FUTURE MARKET VOLUMES

There are three major sources on which forecasts may be based. They are: (i) what people say, (ii) what people do and (iii) what people have done.

3.3.1 Forecasting from 'What people say'

This involves three separate exercises.

- (i) Discussions with customers - discussing future volumes with customers has the limitations that (a) future clients cannot always be identified in advance, (b) customers may not know themselves what their future volumes will be, (c) they may not be willing to divulge this sort of information and (d) the cost of gathering information may be prohibitive. The advantages are. that it is from the 'horse's mouth' and therefore an educated guess.
- (ii) Discussions with salesmen - using a salesman's knowledge of his market to predict can yield useful results provided that personal biases are eliminated. This method has the

advantages that (a) the salesman are likely to be the most knowledgeable source of information beside the customer, (b) the salesman are co-operative and (c) the salesman obviously give a commitment when producing forecasted volumes.

- (iii) Discussions with outside experts or agencies - parties not directly involved with, but closely related to the movement of goods can provide useful information on future trends. The usefulness and validity of this information, however, can vary depending on the relationship to the situation being considered.

3.3.2 Forecasting from 'What people do'

This refers primarily to the results of market tests and, in the context of this study, would apply mainly to the ancillary transport operators where their products or specialized services undergo a market test.

The contribution made by this source of data tends to be small relative to the other sources mentioned.

3.3.3 Forecasting from 'What people have done'

This involves a systematic study of historical information with the view to projecting trends and opportunities into future business. If past relationships prove to be reasonably stable, they can be used as a basis for predicting future trends. There are three useful types of relationships (in order of usefulness):

- (i) Linear relationships - a straight forward extrapolation provides a useful indication of trends.

- (ii) Cyclical relationships - provided cycles are regular, and explicable (e.g. seasonal), these relationships can also prove useful if projected in the same pattern.
- (iii) Interrupted relationships - these are relationships which would fall into categories (i) or (ii) except for the fact some event, such as a strike, has broken the continuity of the relationship. As long as interruptions can be identified and explained, these curves can be projected as in (i) and (ii).

In making use of this method, one must always bear in mind any new events or changes that may cause deviations from historical performance levels when projecting forward. Historical data must not be taken at face value.

This, very broadly, covers the sources of information a company can draw on when attempting to rationally appraise the future market. Whichever method is used, the results of this exercise are critical to the success of what follows in this study; namely estimating future vehicle capacity requirements and costs. If the projected volumes are incorrect, the subsequent calculations become meaningless.

3.4 VEHICLE REQUIREMENTS

Once the future volumes of goods or passengers have been established, the next step is to determine the number of vehicles required to transport these volumes.

This is done, very briefly, by dividing the total volume by the vehicle capacity (thereby arriving at the number of full loads necessary to move the volume), and dividing the number of loads by the

maximum number of loads possible in the time available to do the work. This figure represents the number of working vehicles required to carry out this volume of work.

This grossly oversimplified method mentioned above will now be applied, in more detail, to the transport types selected for this exercise making a note of where complications or differences occur. Some time will be spent on the first case study (i.e. parcel delivery) as this tends to set the pattern for many of those that follow.

The writer has, for the purpose of being consistent, looked at volumes over a period of time rather than for individual jobs. The method is the main point, and is applicable in either case.

3.4.1 Parcel delivery

The example selected here is frozen food deliveries. A sample set of projected volumes and vehicle calculations are shown below in table 3.1:

1	2	3	4	5	6	7	8
Route or Area	Weekly volume (KG)	Average Route Payload	Average Jobs per week	Average Round Trip time (Hours)	Maximum Trips Possible	No. of Vehicles Required	Special considerations
1	14,000	7,000	2,000	5,0	10	0,20	
2	2,000	3,000	0,67	11,0	5	0,13	Very restricted entrance; fuel tank range.
3	11,000	5,000	2,20	2,5	20	0,11	
4	72,000	5,000	14,40	3,0	15	0,96	
5	6,000	7,000	0,86	9,0	5	0,17	Fuel tank range
6	25,000	5,000	5,00	6,5	5	1,00	
7	55,000	7,000	7,86	4,0	10	0,79	
TOTALS	185,000	-	32,99	-	-	3,37	-

Table 3.1 Frozen food volumes and vehicle requirements

The method followed in Table 3.1 will be explained by going from column (1) through to column (8).

Column 1

The route or area applies to the locality of the delivery points. Individual customers can also be used, but in the consumer market, the number of customers is likely to be large, with many of them only purchasing small weekly volumes. By grouping delivery points, the overall number becomes more manageable. Since frozen food deliveries are of a multi-drop nature, this grouping into routes or areas is quite acceptable.

Grouping can either be done by putting together all customers that will be serviced on a particular delivery (the objective being to deliver the maximum volume of goods with the minimum amount of kilometres being covered) or else by putting together all those deliveries which take the same time to complete.

Column 2

Weekly volumes are taken in preference to daily or monthly volumes. The reason for this is that daily orders can fluctuate tremendously and are not necessarily representative of market fluctuations. Orders can very often be delivered several days after being placed with no ill effects being felt by the customer. The monthly volumes, on the other hand, can reduce weekly peaks which are representative of market changes to the extent that they become hidden, and are therefore not catered for. Deliveries can be postponed for a day or two without repercussions very often, but rarely can they be postponed for a month without some unpleasant consequences.

Kilograms are used as the unit of volume since this is the most common measurement used in this field.

Column 3

The average route payload assumes certain size vehicles are used on certain fixed routes, hence the round numbers shown in this column.

An alternative method is to take the weighted average payload which assumes that any vehicle in the fleet can be used on any delivery route. The method of arriving at the weighted average payload is the following:

$$\text{Weighted average payload} = \frac{\sum (\text{No. of each size vehicle in fleet} \times \text{payload})}{\text{Total no. of vehicles in fleet}}$$

The most suitable method depends on the variety of different vehicles in the fleet and the amount of switching of vehicles between routes that takes place.

Column 4

The average trips (or loads) per week is arrived at by dividing the weekly volume in column (2) by either the average route payload or the weighted average payload in column (3).

Column 5

The average round trip time per route is taken as being the time from when the vehicle begins loading to the time the vehicle returns to the depot empty. This can only be achieved if some sort of

standardization of routes, and route times is undertaken.

Column 6

The maximum number of trips possible per week can be established with the diagrammatical assistance of exhibit 7. This exhibit illustrates the number of deliveries possible during a normal working day (7.00 a.m. to 6.00 p.m.) for varying round trip times. To get the maximum trips possible per week, the number possible per day must be multiplied by the number of working days in a week, usually taken as five days.

Column 7

The number of vehicles required (- the ultimate objective of these calculations) is derived by dividing the average trips per week (i.e. column (4)) by the maximum number of trips possible per week (i.e. column (6)). This gives *the proportion of a working vehicle* required to undertake that volume of work.

Column (8)

This refers primarily to specialized equipment as called for by customers' requirements. When totalling up vehicles required, vehicles of a specialized nature must be kept as a separate total. Two examples are given, one referring to a restricted entrance and the other referring to two long distance deliveries that will require either long distance fuel tanks or outside purchasing facilities for fuel.

The next step is to compare the required number of vehicles

with those actually available. This is done in table 3.2.

Route or Area	Vehicles Required	Vehicles Available	REMARKS
1	0,20	-	Taken up by excess capacity in Area 2
2	0,13	1,00	
3	0,11	-	Taken up by excess capacity in Area 2
4	0,96	1,00	
5	0,17	-	Capacity required
6	1,00	1,00	
7	0,79	-	Capacity required
TOTAL	3,36	3,00	

Table 3.2 Fleet requirements and fleet available

It must be noted that, up to this stage, *no downtime whatever has been taken into account*. It is therefore necessary to build in a reserve factor to cover this aspect of an operation.

Generally speaking, this reserve factor is best determined from historical data. Two types of downtime exist. These are:

- (i) scheduled downtime (e.g. servicing, washing)
- (ii) unscheduled downtime (e.g. breakdowns, punctures, delays)

Both types can be accounted for by looking at the hours lost for each type of downtime as a proportion of the total time as a proportion of the total time available to do the work. For example, in an operation working normal hours only, table 3.3 gives a monthly record of downtime statistics:

Job No.	Date	Vehicle fleet no.	Unscheduled downtime		Scheduled downtime		Details
			Breakdown	Puncture	Delay	Service Roadworthy test	
4377	3.6.75.	TU3	0800-1200				Not starting
4394	5.6.75.	TU1	1430-1800				Wheel bearing collapsed
4406	11.6.75.	TU1				0700-1500	50,000 km 'A' service
4427	18.6.75.	TU2		1015-1300			
4431	24.6.75.	TU3				0730-1700	110,000 km 'C' service
4449	29.6.75.	TU3			0930-1015		Police vehicle check
TOTAL TIME			7½	2¾	¾	17½	-

Table 3.3 Downtime schedule

The total downtime is therefore

$$= (7\frac{1}{2} + 2\frac{3}{4} + \frac{3}{4}) \text{ unscheduled} + (17\frac{1}{2}) \text{ scheduled} = 28\frac{1}{2} \text{ hours}$$

The total available time is

$$= 3 \text{ vehicles} \times 11 \text{ hours daily} \times 5 \text{ day working week} \times 4\frac{1}{3} \text{ weeks per month}$$

$$= 714\frac{1}{2} \text{ hours}$$

$$\text{percentage downtime} = \frac{28\frac{1}{2}}{714\frac{1}{2}} = 3.98\%$$

The total number of vehicles required therefore in terms of Table 3.2 is

= the number of working vehicles required + reserve for downtime

$$= 3,36 + (3,36 \times \frac{3,98}{100}) = 3,49 \text{ vehicles.}$$

Since only three vehicles are available, it is obvious that one further vehicle is required if the given volume of work is to be undertaken. It is important at this stage, before entering into capital expenditure, to double check that the market forecasts are realistic.

Having assured oneself of the validity of the market forecasts, it is necessary to determine what type of vehicle to purchase. Payload is the only aspect that will be reviewed here.

	3 Tonner	5 Tonner	7 Tonner
Vehicles required (from table 3.1)	0,13	0,11	0,20
		0,96	0,17
		1,00	0,79
Total available vehicles required	0,13	2,07	1,16
Reserve factor for downtime	0,01	0,08	0,05
Total vehicles required	0,14	2,15	1,21
Total vehicles available	1,00	2,00	0,00

It can be seen that a 7 tonner payload vehicle is the best choice if the fleet is to have sufficient carrying capacity for the projected market volumes.

3.4.2 Passenger transport

The transportation of non-white passengers has been chosen as an example here.

Projected volumes and vehicle calculations are shown in Table 3.4.

This type of work is different from that discussed in section 3.4.1 in that it generally involves part-loads only and also that its service level is based on the number of vehicles coming past a particular point in a given period of time. This calls for a different method of vehicle calculation from that used in table 3.1 as shown in table 3.4.

Column (1)

The daily time periods are two hourly intervals of any normal day.

Column (2)

The volume is the number of passengers from whom a fare is collected during a particular two hour interval. Daily peak periods are very apparent here.

Column (3)

The passenger arrival rate is viewed two ways:

- (i) for the entire route
- (ii) per stop

1	2	3												4
		Passenger Arrival Rate per Interval												
		10 min interval		15 min interval		20 min interval		25 min interval		% Capacity (seated) utilization				
Daily time period (hours)	Volumes (Passengers)	For route	Per stop	For route	Per stop	For route	Per stop	For route	Per stop	10 min interval	15 min interval	20 min interval	25 min interval	
0600-0800	420	35	0,42	52	0,62	70	0,83	87	1,04	64	95	127	159	
0800-1000	390	32	0,38	49	0,58	65	0,77	81	0,96	59	89	118	148	
1000-1200	185	15	0,18	23	0,27	31	0,37	39	0,46	28	42	56	70	
1200-1400	140	12	0,14	17	0,20	23	0,27	29	0,35	21	32	42	53	
1400-1600	280	23	0,27	35	0,42	47	0,56	58	0,69	42	64	85	106	
1600-1800	610	51	0,61	76	0,90	102	1,21	127	1,51	92	139	185	231	
1800-2000	90	7	0,08	11	0,13	15	0,18	19	0,23	14	20	27	34	
Total or average	2115	-	-	-	-	-	-	-	-	46	69	91	114	
No. of buses required		12		8		6								

Table 3.4 Passenger service volumes and vehicle calculations

Assuming 55 seater buses are used with additional standing room for twenty passengers

$$\text{Arrival rate for route} = \frac{\text{Volume (passengers)}}{\text{No. of intervals in two hourly period}}$$

$$\text{Arrival rate per stop} = \frac{\text{Arrival rate for route (passengers)}}{\text{No. of bus stops on route (= 84)}}$$

$$\text{No. of buses required per two hourly period} = \frac{2 \text{ hours} \times 60 \text{ minutes}}{\text{Bus arrival interval (minutes)}}$$

$$\% \text{ capacity utilization} = \frac{\text{Volume (passengers)}}{\text{No. of buses} \times 55 \text{ seats}} \times 100$$

for a number of different bus arrival intervals. The exact method of calculating the data is given under table 3.4. These figures act as an index for the worth and the service level requirements of a particular route.

Column (4)

The percentage capacity utilization refers to the amount of vehicle carrying capacity made use of by the projected volumes for different bus arrival intervals. The method of calculation is shown under table 3.4.

This information, allied with details on the average distance travelled per passenger, the maximum rates permitted by the price controller and the operating costs of running a bus service, form the basis on which management takes a decision on the number of buses required. A minimum of 44% capacity utilization has been used here to illustrate the method. This minimum will vary greatly depending on the requirements of the route. Thus, it can be seen from table 3.4 that the following service levels are recommended:

Daily Period	0600- 0800	0800- 1000	1000- 1200	1200- 1400	1400- 1600	1600- 1800	1800- 2000
Bus arrival intervals	10min	10min	20min	25min	15min	10min	30min
No. of buses required	12	12	6	4,8	8	12	3

Table 3.5 Bus requirements

It must be assumed that considerable thought has gone into arriving at the minimum satisfactory service level taking into account such things as the operating details of a route, the problems associated with daily peaks, downtime and the psychological make-up of the market place, with particular reference to their attitudes towards waiting, alternative modes of transport and the cost of travel.

3.4.3 'Ad hoc' flatbed

The example selected for this category is that of a general cargo transporter who has a minimal amount of regular base work, business being mainly of a irregular one-off nature.

The method of calculating vehicles in this case is almost identical to the method outlined for 'Parcel Delivery' (see table 3.1). The projected volumes and the vehicle calculations for this type of transport are shown on table 3.6 and exhibit 8.

(NB The weighted average payload method is used here assuming a fleet of one-7 tonner, four-9 tonner and two-16 tonner vehicles. The 25 tonner vehicle is excluded since it is allocated to one customer).

Customer	Volume	Weighted Av. Payload	Trips per month	Av. Round Trip times (Hours)	Max. Trips Per month	Vehicles Required
Smith & Sons	100	10,7	9,35	10	21	0,46
Indus. Timbers	1100	25,0	42	5	42	Allocated 1,00
Engineering Ltd	70	10,7	6,54	34	10	
Master Builders	50	10,7	4,67	66	4	1,17
Supermarket	150	10,7	14,02	3	63	0,22
Other	1200	10,7	112,15	3	63	1,78
TOTALS	2670	-	188,73	-	-	5,28

Table 3.6 'Ad Hoc' flatbed volumes and vehicle requirements

The only real difference between the 'Ad hoc' transport and the Parcel delivery service does not come out in the tables. That difference is the ability to project, with reasonable accuracy, the future market volumes.

In the case of Parcel deliveries (i.e. frozen food) the market is always there and is measurably consistent. It is therefore predictable.

This is not so for the 'Ad hoc' transport which only has one allocated vehicle (to 'Industrial Timbers') which can be considered reasonably predictable. For the balance of the projected volumes, there is little or no guarantee that the work will come up. This lack of predictability becomes extremely dangerous, in terms of these vehicle calculations, when looking at work which ties up a vehicle for lengthy periods.

An example of this situation is given in 'Master Builders' where the volumes are low, but the vehicle requirements high because of the high round trip times. Should these volumes not materialise, as they may well do in this highly uncertain environment, the company may find itself with an excess of equipment that it must find work for.

Downtime must still be taken account of as it was for Parcel delivery to provide a reverse factor in the event of breakdowns, punctures and the like. The method used is the same as previously described.

Once the calculation is complete, a comparison between the amount of vehicles required and the amount of vehicles available will reveal any shortfall and excess in vehicle capacity requirements.

3.4.4 Pre-mixed concrete

Pre-mixed concrete has been selected as an example of short haul - construction site type work.

This type of work is one of the simplest as far as vehicle calculations go in that only full loads of the same product are being

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This type of work is one of the simplest as far as vehicle calculations go in that only full loads of the same product are being

catered for (i.e. concrete in mixers, sand and stone in tippers) with only one loading point and one discharge point per trip.

Table 3.7 gives sample volumes and vehicle calculations which are arrived at using the same method as described for Parcel delivery work.

Customer	Volumes (Cu metres)	Wt Average Payload	No. of Trips per month	Av.Round trip time	Possible trips per month	Vehicles Required
A	4,800	5,91	812	1	252	3,22
B	6,700	5,91	1134	3	84	13,50
C	400	5,91	68	1,25	189	0,36
D	700	5,91	118	4	63	1,87
TOTAL	12,600		2132			18,95

Table 3.7 Pre-mixed volumes and vehicle requirements

The fleet is assumed to consist of fifteen 7 cubic metre, six 4 cubic metre and two 3½ cubic metre vehicles working between the hours of 6.00 a.m. and 6.00 p.m.

Exhibit 9 shows the maximum trips possible per month.

As for the previous calculations, the number of vehicles required has to be adjusted to provide a reserve factor for downtime. This is done in the same manner as outlined previously.

Having determined the total vehicles required and comparing this with the vehicles available, it can be decided whether or not more vehicles are required.

3.4.5 Containerized waste

This example is inclusive of any operation where there is a greater amount of carrying capacity relative to the number of motorized vehicles to move that carrying capacity. Examples are containers, demountables and semi-trailer shuttle services.

In this case it is necessary to do *two* capacity calculations. These are:

- (i) carrying capacity (e.g. containers, semi-trailers)
- (i.i) vehicle capacity (e.g. rigids, mechanical horses)

This method is the same as previously discussed, except that it is done twice, each time focusing on a different type of capacity.

(i) Carrying capacity

Here, the equipment in which the goods to be transported are enclosed is being discussed.

Table 3.8 provides sample volumes and capacity calculations. Slight differences from previous tables are apparent in that

- (i) market segments are used in preference to customers since the container requirements are more related to the type of service required than the individual customer themselves.
- (i.i) containers are identified according to size and type as the totals for each different type of container is required at the end of the exercise.
- (i.ii) 'containers used monthly' is equivalent to 'average trips per month' in previous tables.
- (iv) 'average retention time' replaces the 'maximum possible trips per month' of previous tables but serves the same purpose in that it measures the time equipment is tied up in revenue producing work.

Market segment	Service type	Monthly volumes	Container size	Container type	Container payload	Containers used monthly	Av. retention time	Container turnover frequency	Containers required
1	Regular	-	4 cu.metre	Regular	5 ton	243	6 days	3,5	69,43
2	Regular	-	4 cu.metre	Regular	5 ton	172	14 days	1,5	114,67
3	24 Hr.notice	1,200 ton	4 cu.metre	Closed	5 ton	240	6 hours	38,5	6,23
4	24 Hr.notice	615,000 l	4 cu.metre	Closed	5000 litre	123	6 hours	38,5	3,19
5	24 Hr.notice	2,100 ton	10 cu.metre	Regular	9 ton	233	1 day	21,0	11,10
6	Ad hoc	1,950 ton	4 cu.metre	Clean & closed	5 ton	390	1 day	21,0	35,00
7	Ad hoc	620 ton	16 cu.metre	Compactor	12 ton	52	6 hours	38,5	1,32

Table 3.8 Container volumes and capacity requirements

(a) The frequency of turnover of one container in a month = $X = \frac{21 \text{ days (i.e. one working month)}}{\text{Average retention time (in days)}}$

(N.B. When the retention time is in hours, to convert to days, an eleven hour working day is used).

(b) No. of containers required at any one time = $\frac{\text{Containers used monthly}}{X}$

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(N.B. When the retention time is in hours, to convert to days, an eleven hour working day is used).

(b) No. of containers required at any one time = $\frac{\text{Containers used monthly}}{X}$

The method of calculating the frequency of turnover of containers and the number of containers required are by means of the formulae given under table 3.8. A notable exception is market segment 6 where the number of containers has arbitrarily been raised to allow for peak demands in this 'ad hoc' market.

Totalling up, the following containers are required:

4 cu metre regular	4 cu metre closed	10 cu metre regular	16 cu metre compactor
69,43	6,23	11,10	1,32
114,67	3,19		
	35,00		
<hr/> 184,10	<hr/> 44,42	<hr/> 11,10	<hr/> 1,32

These figures are rounded off to the nearest whole number, possibly allowing for a small reserve factor on container downtime, and compared with the containers available. Specialized containers like the compactor require particular care when additional equipment is required because of the expense involved, not only in the containers themselves, but also in the specialized prime movers that go with them.

(ii) Vehicle capacity

Here, the focus is on the motorized vehicles which containers mentioned in the 'carrying capacity' calculations.

Projected volumes, which are a continuation of table 3.8 are provided in table 3.9.

Market Segment	Containers used monthly	Container Size & Type	Av. Round Trip time (Hours)	Max. Trips possible per month	Vehicle requirements
1	243	4 cu. m.regular	2,50	84	2,89
2	172	4 cu. m.regular	2,00	105	1,64
3	240	4 cu. m.closed	3,75	63	3,81
4	123	4 cu. m.closed	3,00	84	1,46
5	233	10 cu. m.regular	2,00	105	2,22
6	390	4 cu. m.closed	4,00	63	6,19
7	52	16 cu. m.compactor	2,50	84	0,62
TOTAL	1453				

Table 3.9 Prime mover volumes and vehicle requirements

This table is arrived at using the same method as described for the Parcel delivery service. The 'containers used monthly' is equivalent to the 'average loads per month' on previous tables. Exhibit 10 is used to arrive at the 'maximum trips possible per month'.

The vehicle requirements are therefore

4 cu metre	10 cu metre	Compactor
2,89	2,22	0,62
1,64		
3,81		
1,46		
6,19		
<u>15,99</u>	<u>2,22</u>	<u>0,62</u>

A reserve factor for downtime should be added onto these figures as previously described under 'Parcel delivery' to arrive at the final total vehicle requirements. Notice should be taken of the fact that market segment 6, although being strictly 'ad hoc' in nature, requires a substantial amount of vehicles. This is a dangerous type of work to base too much capital expenditure on unless it is fairly certain that that work will be forthcoming.

3.4.6 Bulk transport

This category like that for pre-mixed concrete, is one of the simplest so far as vehicle requirement calculations go, the only difference being that for the example selected for bulk transport (i.e. bituminous products) the work is long distance as opposed to pre-mixed concrete's very local type of operation.

The reasons for the simplicity are the same as stated for pre-mixed concrete.

Volumes and calculations are given in table 3.10.

The table is calculated in exactly the same manner as described for Parcel delivery.

Three different customers with the same average round trip time are selected to show the effect restricted loading and discharge rates have on the number of vehicles required. This is illustrated diagrammatically on exhibit 11.

Downtime must be taken into account in the same manner as

Customer	Monthly Volumes (Tonnes)	Av. Weighted payload (Tonnes)	No. of loads per month	Av. Round Trip time	Max. possible trips monthly	Vehicles required	Special requirements
A	500	22	23	34	17	1,35	No Sunday loading or discharge
B	2700	22	122	34	21	5,81	
C	66	22	3	99	7	0,43	
D	1500	22	68	34	17	4,00	Normal working hours discharge only
E	370	22	17	15	48	0,35	
TOTAL	5136					11,94	

Table 3.10 Bulk transport volumes and vehicle requirements

previously mentioned. It is interesting to note here that the downtime reserve factor is, generally speaking, larger in long distance work than local work because of the time required to get to a vehicle in the event of a breakdown.

3.4.7 Abnormal loads

Similar to the pre-mixed concrete - bulk transport parallel, this category is similar to the 'ad hoc' flatbed category, most of the work being of a one-off nature. Well established companies can very often develop a body of regular customers, but by virtue of the nature of work, a regular customer is no guarantee of regular work.

Apart from the difficulty in predicting future volumes of traffic, the method of calculating the number of vehicles required is complicated by several factors. These are:

- (i) the size of a load varies greatly. Loads are not always necessarily full loads, and even a full load can be based on either a weight or a dimension constraint.
- (ii) truly abnormal loads can alter average trip times if special routes and speed limits have to be complied with.

As a result of all these inherent problems with this type of work, vehicle calculations are of limited value. If it is at all possible to minimize these complications, then the same method as was used for the 'ad hoc' flatbed vehicle calculations can be used (i.e. table 3.6) remembering to make an adjustment for downtime at the end of the exercise.

3.5 SUMMARY

This chapter has been devoted to discussing the information on which a transport company can base its equipment requirements. Since road transport is a capital intensive industry, this is a very necessary step if the long term future of a company is to be safeguarded.

A standard method of calculating vehicle requirements has been outlined, with examples having been worked through for seven different types of transport. Where necessary differences have been covered where they affect the calculations significantly.

CHAPTER FOURROAD TRANSPORT COSTS

4.1 INTRODUCTION

This chapter is a discussion on the monetary costs involved with road transport operations.

Cost centres will be discussed under the headings of 'Operating', 'Maintenance' and 'Administration', the first two having both a fixed and variable cost component. The main focus under the individual cost centres will be to highlight the most important factors which influence the cost of these particular items.

After reviewing all cost centres, a comparison will be made of the operating variable costs between the selected sample of road transport types. The reason for only looking at the operating variables is that these cost centres relate directly to the nature of the market being operated in (i.e. what is being looked at in this dissertation) whereas the other headings are very dependent on management policy decisions.

4.2 Costs

The major costs, as they are incurred in road transport, are summarized in table 4.1.

Operating costs include all costs incurred whilst vehicles are

4.3 Operating variables	4.5 Operating fixed
(1) Fuel	(1) Salary, wages and benefits
(2) Salaries and wages - overtime	(2) Licences and permits
(3) Tyres	(3) Insurance
(4) Travel and subsistence	(4) Vehicle depreciation
(5) Outside hire	(5) Other
(6) Claims - provision	
(7) Manpower training	
(8) Cars and vans	
(9) Washbay	
(10) Other	
4.4 Maintenance variables	4.6 Maintenance fixed
(1) Salaries and wages - overtime	(1) Salaries, wages and benefits
(2) Materials	(2) Equipment depreciation
(3) Outside work	(3) Other
(4) Consumable stores	
(5) Accidents - provision	
(6) Other	
4.7 Administration	
(1) Insurance	
(2) Interest	
(3) Rent/Amortization	
(4) Salaries, wages and benefits	
(5) General overheads	
(6) Other	

Table 4.1 Summary of road transport cost centres

physically working in the role for which they were purchased, that is, for the conveyance of goods and passengers.

Maintenance costs are those costs incurred in keeping all vehicles in a working and roadworthy condition. Both scheduled and unscheduled maintenance work are included.

Administration costs are those which are, generally speaking, unrelated directly to the vehicles themselves, but more to the flow of money and information in and out of the company as a result of vehicle operations and maintenance. Since this heading tends to contain a large number of miscellaneous items not easily classified as fixed or variable costs, it is usually accepted as being a fixed 'overhead' cost. No separation of the cost components is therefore done in this case.

4.3 OPERATING VARIABLES

4.3.1 Fuel

Along with overtime wages, the cost centre is likely to be the targets under operating variables. Fortunately, it is reasonably predictable provided certain basic information is known. The information is as follows:

- (i) The number of each vehicle make, type and size in the fleet.
- (ii) The average fuel consumption in litres per 100 kilometres for each of these types of vehicles. This can be obtained either from historical information or else from a specific test.

- (iii) The distance to be travelled, preferably broken down according to kilometres to be travelled per vehicle type.

Combining the information from (ii) and (iii), it is possible to calculate the volume of fuel to be used in litres.

- (iv) The type of fuel to be used. Different fuels will have different prices so it is important to know if petrol (and if so, what grade of petrol) or diesel is to be used.
- (v) The place of purchase of fuel can naturally effect the price. Bulk users usually get preferential rates and rebates for fuel delivered to their depot. Fuel purchased from service stations, either 'en route' or by small transport operators is generally more expensive.

If both types are purchased, a ratio of the relative quantities from each source is required.

- (vi) The type of traffic conditions to be encountered. Heavy stop-start traffic conditions call for more accelerating, and gear changing than on freer flowing routes which is affected in the vehicle fuel consumption.
- (vii) The type of terrain affects fuel consumption in that hilly conditions involve long slow ascents and descents where more fuel is required.
- (viii) The use of ancillary equipment. Loading and discharging equipment driven by means of the vehicle's motor will contribute towards a higher fuel consumption.
- (ix) The standard of driver technique. Fuel consumption is very much related to the manner in which a driver handles his vehicle. The correct techniques must be developed by means of the appropriate training, sufficient supervision (either manual or mechanical) and financial incentives where necessary.
- (x) The mechanical condition of the fleet. Old and mechanically defective vehicles can increase overall fleet fuel consumption if not attended to timeously.

- (xi) The distance travelled under load has a higher average fuel consumption rate than the distance travelled unladen. This is because the motor is actually 'working' when under load as opposed to 'idling' when unladen.
- (xii) The amount of non-revenue kilometres travelled is not usually included in projected volumes, so can become a factor to be considered if it involves a fair amount of kilometres.

The first five points are the most important of the abovementioned factors when it comes to projecting fuel costs. The remaining points are influencing factors, but are, by and large, non-quantifiable considerations.

4.3.2 Salaries and wages - overtime

Overtime is a variable cost in that it is dependent on the output of work, the excesses being taken up in overtime, and in the fact that, if there is insufficient work, the company is not required to pay any overtime wages as is necessary with basic salaries and wages. Thus, this only becomes a cost factor when the units of work produced go beyond the normal capacity of a company's resources.

Three different sources of overtime are included here. These are:

- (a) driver overtime
- (b) driver attendant overtime (e.g. loading attendants)
- (c) depot staff overtime (e.g. dispatches, lower attendants)

All of these will be discussed together in general terms applicable to each type of overtime.

Overtime presents two major hazards from the budgeting and costing point of view.

Firstly, overtime is often a means of taking up the overflow of work that cannot be done in normal working time. Thus, if there is insufficient manpower capacity, either through peaking of work or load planning, profits are eroded away by expensive overtime.

Secondly, overtime is often open to abuse by employees wishing to inflate their earnings. Road transport is particularly prone to this since drivers are very much their own masters when out on the road. To minimize this, it is necessary to have effective control systems on all overtime earning situations.

The major considerations when budgeting or costing on overtime are the following:

- (i) The volume of work to be done and the available capacity (equipment, personnel and otherwise) to do that work. If there is sufficient capacity, to what extent, and at what cost will surpluses be taken up in overtime hours. This is particularly relevant in peak periods and when considering weekend work.
- (ii) The availability of reserve personnel to replace staff coming on to overtime. This is not always practical, as in the case of long distance work.
- (iii) The maximum legal amount of overtime that can be paid to any single employee in a working week is outlined in the Government Gazette regulation gazette No. 1018 of September 1968 Section 5. Severe restrictions are imposed on non-long distance operators by this document.
- (iv) In the case of long distance work, the amount of 'built-in-overtime' acceptable for the volume of work to be done. That is,

the standard amount of overtime built into the average round trips of all customers taken into account in the vehicle calculations.

- (v) The amount of Saturday and Sunday time to be worked. Saturdays are usually paid at time and a third whilst Sundays are paid at double time, therefore making it preferable to avoid working on these days where possible.
- (vi) The probability of replacing slow labour intensive loading and discharge methods with faster mechanical methods.
- (vii) Instead of paying long distance drivers 'round-the-clock', provide satisfactory accommodation facilities (e.g. sleeper cab) and pay a night out allowance only.
- (viii) The possibility of developing mathematical relationships between overtime hours and other statistical data such as kilometres, trips or operating hours. If at all possible, these relationships (preferably linear) can provide useful indices on which to base cost estimates.
- (ix) A reserve factor to take account of overtime that is created by unforeseeable events such as breakdowns or delays at loading and discharge sites.
- (x) The current overtime hourly rates for categories of operating employees and the current wage market environment (i.e. are wage increases imminent?)

This summarizes the most important factors influencing operating overtime.

4.3.3 Tyres

Similar to 'Fuel', this cost centre is reasonably predictable in that it can be related to quantifiable units. In this case, the units are kilometres.

Factors which will influence the indices used are:
are:

- (i) The fleet or vehicle type characteristics. This means specifying the number of each type of vehicle, the number of axles on each vehicle and the number and size of tyres fitted to each axle.
- (ii) The type of operating conditions. Tyre life is considerably reduced in off-highway work through abrasion and in in-town work through increased scruffing, braking and collisions with kerbs, bollards and other such immovable objects.
- (iii) Driver care. Proper education of drivers in the methods of prolonging tyre life, particularly in the high consumption operations mentioned in (ii), can pay dividends in the long run.
- (iv) The retreading of tyres. As tyre casings can last longer than the tread on a tyre, it is logical to make use of them after a tread has been completely used.

The relative costs and life cycles will determine the ideal ratio of retreads to new tyres for a given set of circumstances.

- (v) The relative distances travelled under load compared with the distances travelled unladen.
- (vi) The most economical and efficient method of providing replacement tyres to vehicles with tyre problems. Spare tyres can either be carried on each vehicle, or else a stock of tyres can be kept at some centralized point with vans to distribute them.

The variety of tyre sizes, minimum stock requirements and distances to be covered usually determine whether or not the latter method is practical or not.

- (vii) The quality of tyre to be used. The cost, tyre life and failure rate can be used to prove or disprove the advantages of running on better quality tyres.
- (viii) Whether radial or cross ply tyres are used? Radial tyres improve fuel consumption but are more susceptible to sidewall damage than cross ply tyres. Therefore radials are better suited to long distance on-highway work and not off-highway or in town work for the reasons stated in point (ii).
- (ix) The relative prices of new and retreaded tyres offered by all available agents and manufacturers.

4.3.4 Travel and subsistence

This cost centre covers all living expenses incurred whilst company employees are away from home on behalf of the company. Examples would be hotel bills, meal and night out allowances and car hire charges.

Depending on a company's mode of operation, these costs can vary from the insignificant to the quite substantial. To determine the extent of the cost centre, consideration must be given to the following points:

- (i) Does the operation involve long distance? If so, to what extent, since meal and night out allowances for drivers and attendants becomes more significant with any increase in long distance type work.

Allowances of this kind can very often be related mathematically to either kilometres or vehicle operating hours.

- (ii) The travelling expenses incurred by management, marketing or operational staff for the purposes of keeping in contact with existing customers.
- (iii) The travelling expenses incurred by the parties mentioned in (ii) for the purposes of pursuing new customers.
- (iv) General travel not directly relating to the customer, but none-the-less, part of running a normal business.
- (v) Travel expenses incurred by technical staff called out on vehicle breakdowns.

4.3.5 Outside hire

The reference here is to the need, if any, of a company to hire outside vehicles for the conveyance of its goods and passengers. Primarily, this applies to peak work periods and the need for some companies to hire cranes and forklifts for loading and unloading vehicles. Consideration is required for the following points:

- (i) Seasonal or cyclical fluctuations in market demands for vehicle capacity. If market peaks exist, the extent and duration of these peaks will determine whether it is better to equip for the peaks or else equip for the average market level and hire in for the peaks. In general, the longer the peak, the more attractive in-company vehicles become.
- (ii) If hiring during peak periods, the availability and cost of such facilities must be investigated. This is particularly true when specialized equipment is involved.
- (iii) The temporary nature of work. Work that is only lasting for a very short period does not warrant expenditure in capital equipment lasting years unless there is sufficient of this type of work to keep a vehicle fully occupied.

- (iv) The quality of company maintenance. Excessive vehicle downtime can create shortfalls in vehicle capacity, necessitating hiring vehicles, if available, in order to meet market requirements.

4.3.7 Claims provision for goods in transit

This is a provision only to cover the cost of goods lost or damaged whilst in transit, either through carelessness, theft or accident.

The major points for consideration are:

- (i) The value of the products carried.
- (ii) The product characteristics. Fragile, volatile and chemically pure products are more open to claims than robust, stable and impure products.
- (iii) The handling methods during loading and discharging. Whatever method is used, what are the risk of loss or damage, and how can these be minimized?
- (iv) Load security during transit. This covers such aspects as load movement, loads falling off the vehicle or damage by the elements (e.g. rain) whilst in transit.
- (v) Goods lost or damaged through involvement in motor vehicle accidents.
- (vi) The cost and benefits of insuring against loss, theft or damage of goods or passengers whilst in transit. The more valuable the load, the more important this consideration becomes.

4.3.8 Manpower training

Correctly trained and motivated staff are essential to running a smooth and efficient service. Hence, therefore, the investment made in developing and motivating all categories of company employees is being looked at.

The most important factors to consider are:

- (i) The major areas of skilled, semi-skilled and unskilled work when training is required. The main personnel involved in the field of transport are the technical and driving staff as well as management.

Educational courses, both internal and external to the company, should be taken advantage of if there are benefits to be reaped for the company. By and large, there is more in the offering for technical staff and management in this regard, than there is for driving staff. The driving staff is, however, one of the most important areas to concentrate on as so much depends on the calibre of person handling expensive company vehicles. In-company training is usually the best answer for drivers since individual company procedures, methods and documentation can be explained thoroughly to all new drivers.

- (ii) The availability and cost of suitable internal and external educational courses.
- (iii) The number of staff that are likely to attend courses. The larger the number, the more worthwhile it becomes to look towards internally generated programmes. This is especially true for semi-skilled and unskilled workers.
- (iv) The rate of staff turnover and the need for training of replacement and additional staff. This will depend very much

on the labour market conditions for different types of workers. Greater availability means less training is required.

- (v) The need for retraining. Retraining of drivers is particularly important since they work without supervision mostly, making it easy for bad habits to develop. This must be checked and corrected, if necessary, at regular intervals.

Retraining of other staff on new methods, procedures, and other such matters is also very necessary from time to time.

4.3.9 Cars and vans

Besides the revenue-earning vehicles as determined in the vehicle calculations, there are likely to be other company owned vehicles. Cars and vans will make up the bulk of these non-revenue earning vehicles.

Points to consider are:

- (i) The number of managers cars in the fleet.
- (ii) The number of salesman cars in the fleet.
- (iii) The number of supervision vehicles in the fleet.
- (iv) The number of maintenance vans in the fleet.
- (v) The number of miscellaneous vehicles in the fleet (e.g. scooter, breakdown truck).
- (vi) The running cost of each of the abovementioned group of vehicles in fuel, tyres and maintenance.

4.3.10 Washbay

The cost of keeping vehicles clean for some types of road transport can be quite significant. There are usually two reasons for

keeping vehicles clean which are:

- (a) company image
- (b) hygiene or cleanliness is part of the requirements for transporting these type of products.

Factors to be considered are:

- (i) Quantities and costs of chemicals, detergents and solvents used in the cleaning process.
- (ii) Quantities and costs of cleaning materials such as rags, waste and brooms.
- (iii) The cost of operating specialized washing equipment (e.g. boiler, high pressure washing equipment or drive-through vehicle washing machines). This will include fuel, electricity, maintenance and water.

4.3.10 Other

This category absorbs the multiplicity of more minor cost items that come up as a result of vehicle operations. Examples of such items would be traffic fines, temporary permits and certificates, drivers uniforms and tackograph charts.

Consideration must be given to:

- (i) The best breakdown of sub-categories within the cost centre which takes account of the types of smaller expenditure that occur.
- (ii) The extent and cost of each sub-category bearing in mind any plans to increase or decrease the size of individual sub-categories.

4.4 MAINTENANCE VARIABLES

Cost centres falling under this heading are very dependent on the ratio of in-company maintenance to maintenance done by outside companies. It was found in this study that the larger fleet operators tended towards in-company maintenance even though it does involve more fixed investment in workshop equipment and facilities, technical staff and spares. This is because the middle-man (i.e. the outside maintenance company) is now eliminated along with his profit.

4.4.1 Salaries and wages - overtime

The overtime costs of all maintenance staff are accumulated under this cost centre. The same hazards as mentioned under 'Operating: Salaries and wages - Overtime' apply here as well as most of the points for consideration.

In addition, the following must be thought through:

- (i) The man-hours of preventive maintenance to be done. For a given volume of work, and with fixed service intervals, this is not too difficult to estimate. Of these man-hours, how much will be done in overtime hours or on Sundays?
- (ii) The same exercise as in (i), but this time looking at repair, overhaul and breakdown work.
- (iii) The labour market conditions for each type of maintenance employee required. Low availability leads to higher overtime.
- (iv) The condition and age of the fleet and how this affects points (i) and (ii).
- (v) Whether or not long distance work is undertaken, as breakdown call outs on this type of work can lead to substantial amounts of overtime.

- (vi) The possibility of developing mathematical relationships relating the different types of overtime (i.e. preventive and repair work) with the amount of work being done by the fleet, either in kilometres or operating hours.

4.4.2 Materials

Materials covers all spare parts and associated items with a useful life expectancy exceeding six months used in the maintenance of vehicles.

The most important considerations are:

- (i) Since materials include such a vast number of different items, what is the best way of subdividing or grouping spares in order to be able to estimate future consumption? For example, categories may consist of engine, gearbox, clutch, differential, chassis, body, electrical and accessories with each being divided up into sub-categories.
- (ii) The overall condition of vehicles in the fleet in terms of age, roadworthiness, general mechanical reliability and expected useful life period.
- (iii) The extent to which the fleet is standardised on vehicles and parts. Standardisation brings with it, the interchangeability of parts, reduced stock levels and better vehicle familiarity to mechanical staff.
- (iv) The stock of materials that are kept in-company with particular attention being given to stock levels and turnover. Ideally stock levels should be kept at a minimum without jeopardising the running of the fleet. The faster moving parts will usually have correspondingly higher stock levels.
- (v) The use of 'pirate' parts stripped off scrapped vehicles or purchased from second hand dealers.

4.4.3 Outside work

This includes all vehicle maintenance work done by outside companies.

For a company with no in-company maintenance facilities, all preventive and repair work will come within the scope of this cost centre. Where there are maintenance facilities, only the more specialized work will go under this heading.

In the case of long distance work, outside work will also be incurred by the calling out of garages along the route to attend to breakdowns.

The most important points to consider are:

- (i) The amount and cost of general repair maintenance done by outsiders.
- (ii) The amount and cost of specialized maintenance work done by outsiders. It is best looked at in sub-categories of skills purchased such as:
 - (a) auto - electrical work
 - (b) signwriting
 - (c) panel beating and spray painting
 - (d) machining and rebuilding of specialized components
 - (e) tachograph repairs

4.4.4 Consumable stores

This is the complement of 'Materials' and includes all parts and stores with a useful life expectancy of less than six months used in the maintenance of vehicles.

The same points apply as mentioned under 'Materials' with regard to whether in-company or outside maintenance facilities are used.

Major considerations are:

- (i) The volume and cost of all oils and greases used in preventive maintenance work. Similarly for repair work.
- (ii) The volume and cost of oil, fuel and air filters used in preventive maintenance work. Similarly for repair work.
- (iii) The volume and cost of all other sub-categories of stores with a life expectancy of less than six months. Examples of such items are:
 - (a) brake linings
 - (b) mechanics overalls (if supplied)
 - (c) paint
 - (d) cleaning solvents
- (iv) The service intervals of the vehicles in the fleet and their suitability in terms of the manufacturers specifications, the conditions under which the vehicles operate and their effectiveness in preventing major breakdowns.

4.4.5 Accident provision

This provision, similar to that of the 'Claims provision' (item 4.3.7), is a cushion against an occupational hazard, in this case, motor vehicle accidents.

The points to be considered are:

- (i) The company's historical performance with regard to frequency and cost of accidents.
- (ii) The efforts under 'Manpower training' (item 4.3.7) to upgrade the quality of the company's drivers, and the results of these efforts.
- (iii) The calibre of drivers currently available in the labour market.
- (iv) The accident prone areas of a company's operation, either by virtue of the places being delivered to or by the method of operating, and what is being done to improve the situation.
- (v) The distance travelled by company vehicles, and the accident exposure levels related to these kilometres. For instance, in-town work involves low kilometres with an exposure mostly to fairly minor accidents, whereas long distance work involves high kilometres with an exposure mostly to fairly major accidents because of the higher speeds involved.
- (vi) The payments made to third parties as settlement for damage done by company vehicles where the company driver was at fault.
- (vii) The payments made to the company in settlement for its own insurance claims for damage to company property caused by third parties.

4.4.6 Other

As in 'Operating vehicles' this cost centre absorbs the multiple of incidental costs which are incurred in keeping a fleet in a good state of repair.

The same considerations as of 'Operating vehicles' (item 4.3.10) apply in this case.

4.5 OPERATING FIXED

All costs in this section are costs that are incurred with time as opposed to the previous section where costs are dependent on the volume of work done. In this case, costs accumulate whether the vehicles are working or not.

4.5.1 Salaries, wages and benefits

All staff connected with the movement of vehicles fall within this cost centre. Therefore, all drivers, attendants, dispatchers, controllers and supervisors fall under this cost centre.

Since basic salary and wage rates are fairly static over long periods, the overall costs involved here are predictable to a large degree. Some thought must be given, however, to the following points:

- (i) The exact number of, and basic rates for, each type of employee required under 'Operating staff'.
- (ii) Any proposed increases or decreases in staff numbers.
- (iii) Proposed increases in basic rates, whether they be cost-of-living or merit increases.
- (iv) The types of benefits offered to all employees and their relative costs. Examples of such benefits are medical aid, pension and Christmas bonuses.

4.5.2 Licences and permits

All annual vehicle licences and permits are included in this cost centre. It should be noticed that temporary licences and permits are a variable cost and therefore are not included here, but under 'Operating variable - Other' (item 4.3.10).

The important points to be considered are:

- (i) The number and cost of licences for all company vehicles, both non revenue and revenue earning.
- (ii) The number and cost of motor carrier permits for all company vehicles requiring them.
- (iii) The number and cost of any further licences or permits required by the fleet.
- (iv) Any additions to or disposals from the fleet in the year being applied for in points (i) and (ii).

4.5.3 Insurance

Annual insurance cover taken out for company vehicles, the goods they are carrying, all company personnel involved in the actual deliveries and third party insurance are grouped under this heading.

Temporary insurance of any kind will fall under 'Administration - Insurance' (item 4.7.1).

The most important considerations are:

- (i) The type and cost of insurance required for all company vehicles.
- (ii) The type and cost of goods-in-transit insurance required.
- (iii) The type and cost of insurance to be taken out as cover for all delivery staff.
- (iv) The vehicle third party insurance requirements.

4.5.4 Vehicle depreciation

This cost centre can be either fixed or variable depending on

the method of depreciation adopted. Vehicles may be depreciated on a strictly time basis, as in this case, thereby becoming a fixed cost or else it may be done on a distance travelled basis, in which case the cost becomes variable.

Considerations relating to this cost centre are:

- (i) The life expectancy of each type of vehicle in the fleet in terms of both years and kilometres travelled taking into account the set of conditions the vehicles will be working under.
- (ii) Which of the above limits are likely to occur first in the lives of the vehicles.
- (iii) Whether the costing exercise is being done for the purpose of financial accounting or of management accounting.
The former type of accounting uses the original purchase price whereas the latter type of accounting (which is used solely for management decision making) is more likely to use the replacement value.
- (iv) If depreciation is on a time base, should a flat rate or accelerated depreciation be used? The answer to this is generally a policy decision based on financial considerations.

Depreciation on distance travelled does not present this problem.

- (v) Depreciation of ancillary equipment (e.g. pumps, refrigeration units) which may have either a longer or shorter life cycle than the vehicle itself.

4.5.5 Other

As for previous 'Other' categories, the multiple of fixed

incidental costs are absorbed in this cost centre.

Usually contracts and agreements of a relatively minor nature form the bulk of items falling under this heading. Examples are:

- (a) contract for hire of two way radio sets
- (b) rental charges for facilities along the routes travelled by company vehicles
- (c) contract for the servicing of fire fighting equipment.

4.6 MAINTENANCE FIXED

This heading covers all costs that are incurred by a Maintenance Department which are based on a time criterion rather than a units-of-work produced criterion.

4.6.1 Salaries, wages and benefits

The same comments and considerations as made under 'Operating fixed' apply here, the only difference being the types of employees under review.

No further comments will be made here therefore.

4.6.2 Equipment depreciation

The more in-company maintenance that is done, the more likely it is that the company will have invested in expensive and sophisticated maintenance equipment. Like vehicles, this equipment also has a

limited useful life, the cost of which must be recovered in any costing exercise.

Some time must be spent on the following:

- (i) Itemising every piece of equipment over a certain value (e.g. R30.00) with the original purchase price, the current market replacement price and the age of the equipment.
- (ii) Determining the useful life periods of each piece of equipment bearing in mind the amount of work to be done by each machine.
- (iii) Whether or not the exercise is being done for financial accounting or management accounting purposes.

4.6.3 Other

The cost centre serves the same purpose as that under 'Operating fixed' and carries the same considerations.

4.7 ADMINISTRATION

In the running of any business, there is always a considerable amount of general administration and paper work entailed. This heading looks at those types of costs as well as any others which cannot be directly attributed to either 'Operating' or 'Maintenance' headings.

4.7.1 Insurance

The balance of a company's insurance policies not outlined under 'Operating fixed - Insurance' (item 4.5.2) are included under this cost centre. Thus any insurance, with the exception of that for

vehicles, goods in transit and delivery personnel, fall within the scope of this particular category of costs.

Major points for consideration are:

- (i) Fire and theft insurance for all depot facilities.
- (ii) Public liability insurance, particularly when hazardous loads are being carried.
- (iii) Personnel insurance for all staff not directly involved in deliveries.
- (iv) Any other insurance of either an annual or a temporary nature which is deemed to be necessary to protect company interests.

4.7.2 Interest

Interest charges on all financial deals entered into by the company are accumulated within this cost centre.

The points to be considered are:

- (i) Interest charges on all hire-purchase and lease agreements. By and large, this will consist of vehicles purchased 'on terms'.
- (ii) Interest on loans made to the company.
- (iii) Interest on mortgages taken out by the company.
- (iv) Interest on bank overdrafts. To determine this, it is necessary to project future cash flows and to make an assumption on prevailing interest rates.
- (v) Interest incurred on any other deals entered into by the company.

4.7.3 Rent or amortisation

Nearly all businesses need to operate from a base. This is particularly so for transport where parking, office and workshop areas are called for.

The base or depot is usually either rented or owned by the company. In the case of the rented depot, the rent is often fixed and agreed upon. For owned depots, the value of that property is 'written off' in very much the same manner as vehicle depreciation.

Consideration must be given to the following:

- (i) Is the depot the correct size for the current and foreseeable future operations. If it is too large, then the company has 'dead' money invested in assets it neither needs nor is it getting any return on. If it is too small, then there is usually a decrease in efficiency in operations because of congestion.
- (ii) Is the depot in the correct location? Incorrect location can result in considerable 'dead' or non-revenue kilometres being travelled.
- (iii) The abovementioned two points must be considered in the light of the merits and demerits of operating out of a large central depot as opposed to a number of smaller, ideally situated, decentralized depots.
- (iv) If depot facilities are rented, what are the advantages and disadvantages of purchasing these, or equivalent, facilities?
- (v) Any proposed increase or decrease in facilities to take account of up or downturns in the market place.

4.7.4 Salaries, wages and benefits

The same comments and considerations apply here as applied under 'Operating fixed - Salaries, wages and benefits', the only difference being the type of employees being considered.

No further comments will be made here.

4.7.5 General overheads

The multiple of *known* items that will come up *regularly* are grouped together in this cost centre. A list of the most common examples of this type of cost appear on table 4.2.

In order to obtain the total costs involved under this heading, each item mentioned in table 4.2, as well as any additional items not mentioned, must be worked through individually to determine the cost of that sub-category first. Only after that, can individual sub-categories be totalled to give the overall cost.

Considerations will depend on factors influencing individual items.

4.7.6 Other

This heading differs from 'General overheads' (item 4.7.5) in that it takes account of the less known and irregular miscellaneous costs.

Since 'Administration' does not have a variable cost heading, this cost centre covers miscellaneous expenses of both a fixed and variable nature. Comments and considerations are the same as for

(a) Water	(m) Cleaning materials & equipment
(b) Electricity	(n) Postage
(c) Telephone	(o) Entertainment
(d) Telex	(p) Management travel expenses
(e) Stationary	(q) Advertising
(f) Printing	(r) Rates
(g) Company documentation	(s) Audit fees
(h) Office furniture	(t) Bad debts
(i) Calculators, typewriters etc.	(u) Magazine subscriptions
(j) Canteen	(v) Donations
(k) Toiletries	(w) Bank charges
(l) Legal fees	(x) Workmens Compensation Fund

Table 4.2 Common general administration overheads

(a) Water	(m) Cleaning materials & equipment
(b) Electricity	(n) Postage
(c) Telephone	(o) Entertainment
(d) Telex	(p) Management travel expenses
(e) Stationary	(q) Advertising
(f) Printing	(r) Rates
(g) Company documentation	(s) Audit fees
(h) Office furniture	(t) Bad debts
(i) Calculators, typewriters etc.	(u) Magazine subscriptions
(j) Canteen	(v) Donations
(k) Toiletries	(w) Bank charges
(l) Legal fees	(x) Workmens Compensation Fund

Table 4.2 Common general administration overheads

'Operating vehicles - Other' (item 4.3.10) and 'Operating fixed - Other' (item 4.5.5).

4.8 TRANSPORT TYPES AND THEIR RELATED OPERATING VARIABLE COSTS

In this section a review of the 'Operating variable' costs for the different transport types selected earlier will be undertaken based on the statistics made available from the company's interviewed for this dissertation.

The objective of this comparison is to highlight differences in the variable cost structure, with accompanying reasons for these differences, for the selected transport types. The objective is not to explain the exact extent of any cost structure differences.

The comparison is only undertaken for the 'Operating variables' since the nature of the business a company is involved in is more likely to be reflected in these costs than in any other type. Fixed costs tend to incorporate the size and method of a company's operation and 'Maintenance variables' are dependent on the amount of in-company work done, thus making it difficult to draw any valid conclusions from a comparison of these costs.

Relative percentage importance for all 'Operating variable' cost centres are given on table 4.3 for each of the transport types as disclosed during interviews with sample companies.

Table 4.4 lists the individual 'Operating variables' in decreasing order of importance as determined by the statistics in table 4.3.

Cost Centre	Parcel Delivery	Bus Service	'ad hoc' flatbed	Pre-mixed concrete	Contain erised waste	Bulk transport	Abnormal loads
(i) Fuel	17,3	59,4	30,7	51,5	33,6	48,7	37,5
(ii) Overtime	58,5	8,9	28,4	17,8	16,1	21,2	10,7
(iii) Tyres	3,9	17,2	12,2	4,8	8,9	19,3	21,4
(iv) Travel and subsistence	0,5	-	0,7	-	-	1,7	2,7
(v) Outside hire	-	-	1,7	-	5,0	-	10,7
(vi) Claims	0,1	-	0,9	-	1,1	0,5	1,4
(vii) Manpower training	0,2	5,2	0,2	4,8	4,7	2,5	1,9
(viii) Cars and vans	13,6	2,6	0,6	2,9	11,9	1,1	4,0
(ix) Washbay	0,2	0,5	0,2	3,8	3,0	1,2	0,8
(x) Other	5,7	6,2	24,4	14,4	15,7	3,8	8,9
TOTAL	100	100	100	100	100	100	100

Table 4.3 Relative percentages of variable costs according to transport types

Cost Centre	1st	2nd	3rd	4th	5th	6th	7th
(i) Fuel	Bus service	Pre-mixed concrete	Bulk transport	Abnormal loads	Contain erized waste	'Ad hoc' flatbed	Parcel delivery
(ii) Overtime	Parcel delivery	'Ad hoc' flatbed	Bulk transport	Pre-mixed concrete	"	Abnormal loads	Bus service
(iii) Tyres	Abnormal loads	Bulk transport	Bus service	'Ad hoc' flatbed	"		
(iv) Travel and subsistence	"	"	'Ad hoc' flatbed	Parcel delivery	-	-	-
(v) Outside hire	"	Contain erized waste	"	-	-	-	-
(vi) Claims	"	"	"	Bulk transport	Parcel delivery	-	-
(vii) Manpower training	Bus service	Pre-mixed concrete	Container-ized waste	"	Abnormal loads	Parcel delivery	'Ad hoc' flatbed
(viii) Cars and vans	Parcel delivery	Container ized waste	Abnormal loads	Pre-mixed concrete	Bus service	Bulk transport	"
(ix) Washbay	Pre-mixed concrete	"	Bulk transport	Abnormal loads	"	Parcel delivery	"
(x) Other	'Ad hoc' flatbed	"	Pre-mixed concrete	"	"	"	Bulk transport

Table 4.4 Order of importance of cost centres amongst transport types

4.8.1 Fuel comparison

This cost centre is the largest contributor to 'Operating variables' for all but one of the transport types. The one exception is that of Parcel delivery.

Control in this area is most important, therefore, if wastage and theft are to be prevented. Bowsers must be locked with a daily check by a responsible person on all fuel drawn or delivered in the depot. Strict purchasing procedures must be followed in the event of internal fuel purchases being required.

The underlying reasons for the order of importance in this cost category are:

- (i) *Bus service* (59,4%) - the constant acceleration and deceleration of large capacity diesel engines entailed in stopping at bus stops spaced relatively close to one another, and the fact that this is an in-town operation with a correspondingly high level of traffic congestion, robots and other similar obstacles accounts for the very high contribution coming from this cost centre.
- (ii) *Pre-mixed concrete* (51,5%) - the reason for the relatively high importance in this case is due to this operation being, by and large, of an in-town nature, thereby encountering the same obstacles as the bus service, plus the fact that for this type of transport, the mixer drum is either driven by the vehicle's engine or by a donkey motor, both of which increase the amount of fuel used.
- (iii) *Bulk transport* (48,7%) - because this is a long distance operation, vehicle motors are working hard for long periods

at a time, thereby consuming large quantities of fuel. In addition, ancillary pumps mounted on tankers require the vehicle's motor to drive them which increases vehicle fuel consumption correspondingly.

- (iv) *Abnormal loads* (37,5%); *Containerized waste* (33,6%) and *'Ad hoc' flatbed* (30,7%) are not exceptional in any way when looking at the relative importance of fuel as a cost centre.
- (v) *Parcel delivery* (17,5%) - the significantly reduced importance of fuel in this type of transport is the result of the much smaller vehicles (with more economical fuel consumptions, particularly on in-town work), a larger proportion of standing time during which the vehicle's engine is not running and because there is no motor driven ancillary equipment involved.

4.8.2 Overtime comparison

The spread of percentage importance is fairly wide for this cost centre. For one type of transport, namely Parcel delivery, it is in fact the most important 'Operating variable' cost centre.

- (i) *Parcel delivery* (58,5%) - the high relative importance for this type of transport is accounted for by the operation being restricted to normal working hours therefore making shift work impractical. Thus a great many deliveries are done on overtime as opposed to taking on extra drivers.

Country deliveries also make a big contribution to the total overtime costs.

- (ii) *'Ad hoc' flatbed* (28,4%) - the reason for high overtime in this

case revolves around the unpredictability of the market being operated in here. Work can materialize at a moments notice necessitating drivers who may have been idle for most of their normal shift to actually work for the first time at overtime rates.

- (iii) *Bulk transport* (21,2%) - the importance of overtime for this category is due to it being long distance work, with drivers and attendants (if applicable) being paid in full for the time they are engaged on a delivery.
- (iv) *Pre-mixed concrete* (17,5%) - overtime here is the result of normal working hours being imposed on this operation (thereby eliminating the feasibility of shift work) with relatively frequent large concrete 'pours' occurring, very often on Saturdays, where, once a job has been started, it must be completed before vehicles can return to the depot for the night.
- (v) *Containerized waste* (16,1%) - this is again due to a normal working hour constraint eliminating the possibility of shift work.
- (vi) *Abnormal loads* (10,7%) - the relatively low importance of overtime here is due to this being a combination of local and long distance work with the movement of vehicles being restricted to daylight hours. This severe restriction has necessitated a different arrangement of paying drivers and attendants (i.e. they are not paid 'round the clock').
- (vii) *Bus service* (8,9%) - overtime is significantly reduced in this operation because a working day is sufficiently long to make use of shift work. This is also possible because all work is of a strictly routine nature, and therefore predictable. Routes can therefore be planned to restrict overtime to the very minimum.

4.8.3 Tyres comparison

Again, there is a fairly wide spread in the percentage importance of this cost centre.

- (i) *Abnormal loads* (21,4%) - the large number of tyres required by vehicles operating on this type of work in order that they fall within the legal maximum axle loadings means that there is more rubber on the road than in the other transport types.

Apart from the general running down of the tyres through normal wear, these multi-axle units also lose a lot of tread through scuffing during cornering.

- (ii) *Bulk transport* (19,3%) - high tyre costs are the result of the high kilometres travelled in relatively short periods. This is a general characteristics of long distance work (cf. Fuel comparison - item (iii)).
- (iii) *Bus service* (7,2%) - high kilometres, continuous alternating between acceleration and deceleration, and collisions with kerbs and other such hazards of built up areas are the causes for the high contribution of this cost centre.
- (iv) *'Ad hoc' flatbed* (12,2%) (v) *Containerized waste* (8,9%), (vi) *Pre-mixed concrete* (4,8%) and (vii) *Parcel delivery* (3,9%)
tyre costs are of a moderate to low importance cost-wise relative to the other transport types, due mainly to the much lower kilometres travelled and the smaller units being operated.

4.8.4 Travel and subsistence

This cost centre is only really significant for those types of transport engaged in medium to long distance work.

- (i) *Abnormal loads* (2,7%) - as mentioned earlier, a different system of paying drivers is adopted for this type of transport because the restriction on vehicles moving in daylight hours only makes overtime exorbitantly expensive. Instead of overtime therefore, there is an increase in the payment of meal, night out and accommodation allowances.
- (ii) *Bulk transport* (1,7%) - this is accounted for by meal and night out allowances incurred on long distance work.
- (iii) *'Ad hoc' flatbed* (0,7%) and (iv) *Parcel delivery* (0,5%) are so low as not to be of any real significance.

4.8.5 Outside hire

Here again, only certain transport types are affected. None appeared to require assistance over peak periods, probably because some of the transport types are so specialized that there are no other companies that can be called on to assist.

What outside hire is required is entirely of a complementary nature to the service already being provided.

- (i) *Abnormal loads* (10,7%) - the importance here is due to large cranes being required very often to assist in the loading of low bed trailers. The larger the crane, the more expensive it is to hire them.

- (ii) *Containerized waste* (5,0%) - costs incurred in this case are mainly the result of the hiring of sub-contractors required in the removal of waste for large one-off jobs.
- (iii) *'Ad hoc' flatbed* (1,7%) - costs are due to the hire of cranes, front end loaders and forklifts to assist in the loading and unloading of vehicles.

4.8.6 Claims

This is a relatively minor cost centre with the percentage importance varying from the low to zero.

- (i) *Abnormal loads* (1,4%) - because of the expensive nature and size of many of the goods involved, the potential for costly damage is greater here than in the other fields of transport.
- (ii) *Containerized waste* (1,1%) - due to the confined working space available at many customers' premises, there is a high frequency of damage done to customers property. Very often settelement is paid out for these even if company drivers were not to blame for the sake of customer relationships.
- (iii) *'Ad hoc' flatbed* (0,9%) - claims generally originate here from the fact that this type of transporter is called in either in the event of a crisis or else for a one-off job. Both of these types of operations fail to allow for relationships to develop between the customer and the transporter to the level where minor indiscretions on the part of the transporter are easily glossed over.
- (iv) *Bulk transport* (0,5%) - claims usually arise here as a result of a spillage of product during loading or discharge. The cost of the lost product is normally the extent of the claim.

- (v) *Parcel delivery* (0,1%) - frozen foods that are either so severely damaged during transportation or else that are no longer fit for human consumption are the main contributors to costs in this case.

4.8.7 Manpower training

An interesting trend is apparent in this cost centre, probably related to the monetary rewards drivers receive. The trend is almost the exact opposite of that for overtime discussed in item 4.8.2.

- (i) *Bus service* (5,2%) - the high cost involved in training drivers is due firstly, to the high driver turnover resulting from the nature of the work (i.e. stop-start driving all day in town traffic) and the limited earnings (i.e. little overtime due to shift work). Secondly, the high degree of skill to negotiate all the obstacles confronting drivers in this type of operation must constantly be brought home to company drivers. Therefore there is considerable training and retraining required.
- (ii) *Pre-mixed concrete* (4,9%) and (iii) *Containerized waste* (4,7%) suffer from the same problems as in (i) but to a slightly lesser degree.
- (iv) *Bulk transport* (2,5%), (v) *Abnormal loads* (1,9%) and (vi) *Parcel delivery* (0,2%) generally have more genial working conditions and higher monetary rewards, either from more overtime being available (as in (iv) and (vi)) or else with a suitably adjusted pay system with payment made in lieu of overtime (as in (v)). The driving force is, therefore, relatively stable in these companies.

- (vii) *'Ad hoc' flatbed* (0,2%) have relatively minor costs here as overtime is available, therefore tending to stabilize the driver resources. There is also a tendency to see driver training as a luxury, and when looking to cut costs, this is one of the first cost centres to be pruned.

4.8.8 Cars and vans

The nature of the market being operated in has a distinct bearing on this cost centre as will be shown.

- (i) *Parcel delivery* (13,6%) -- a large mobile sales force is necessary in this type of market to make calls on the vast number of outlets stocking frozen foods. Thus with a high number of salesmen's cars on the road, this cost centre is proportionally higher than for the other types of transport.
- (ii) *Containerized waste* (11,9%) - a smaller sales force than for Parcel delivery is used in this type of transport, but there is a greater amount of road supervision undertaken. The net result is a high contribution to total Operating Variables.
- (iii) *Abnormal loads* (4,0%) - apart from the normal maintenance and supervision vehicles, escort vehicles are required for those loads that are genuinely abnormal. The number of escort vans required will depend on the penetration into the abnormal load market and the distances covered.

All the other transport types require a relatively standard amount of non-revenue earning vehicles based on the size of the fleet and the spread of a company's customers. Sales, supervision, maintenance and managers' cars are the main reasons for these vehicles.

4.8.9 Washbay

As previously mentioned in the review of washbay costs (item 4.3.9), costs here depend on two major factors:

- (a) company image, and
- (b) cleanliness required because of the product being carried.

From the sequence of relative importance in table 4.4. it appears that the second factor is the most important of the two.

- (i) *Pre-mixed concrete* (3,8%) - if concrete dries either in, or on, the mixer drum of the vehicle, it becomes very difficult to remove and, if allowed to accumulate, decreases the volume of concrete a vehicle can deliver. Some time and effort is therefore spent on cleaning vehicles at the end of a working day.
- (ii) *Containerized waste* (3,0%) - again a dirty product, necessitating cleaning to prevent a build up of waste in the containers.
- (iii) *Bulk transport* (1,2%) - bitumen is a difficult product to clean from a vehicle, but with the correct handling procedures, little or no product should come into contact with the vehicle. Public image seems to be more of a criterion in this case.

The remaining transport types do the minimal of cleaning and that which they do do is more for the sake of general appearance and company image.

4.8.10 Other

To a degree, the relative market natures are shown up in this

cost centre in that some of the miscellaneous costs are unique to a particular type of transport.

- (i) *'Ad hoc' flatbed* (24,4%) - the extremely unpredictable nature of the market can call for innumerable miscellaneous items in order to get a job done. These items may often mount up to quite substantial sums of money.
- (ii) *Containerized waste* (15,7%) - the high relative importance of this cost centre is due almost entirely to 'dumping fees' charged for the use of the local municipal tip area.
- (iii) *Pre-mixed concrete* (14,4%) - the bulk of the cost centre in this case is the result of the continuous quality control which is necessary in this field of work. Off-specification concrete can lead to extremely serious consequences if it is going into such structures as high-rise office blocks and overhead bridges.
- (iv) *Abnormal loads* (5,9%) - temporary permits and police escort charges form a large portion of the costs involved here.
- (v) *Bus service* (6,2%), (vi) *Parcel delivery* (5,7%) and (vii) *Bulk transport* (3,8%) do not have any particularly outstanding miscellaneous costs. The only two costs that may give cause for concern are: advertising for drivers by the Bus Service, in view of their high driver turnover and the cost of heating the bitumen in the case of Bulk Transport. Both are relatively minor costs, but they still require to be monitored for any changes in trends.

4.9 SUMMARY

In this chapter, some time has been spent in reviewing the most common sources of cost to a road transport company and what must

be considered in establishing the amount of each cost centre, either for costing or for budgeting purposes.

Having discussed the theoretical make-up of a road transporters costs, an analysis is done on the Operating Variable cost structure as they come out in practice for the different road transport types. Variations are explained where possible in all cases.

CHAPTER FIVECONTROLLING COSTS AND PERFORMANCE

5.1 INTRODUCTION

In the previous two chapters we have reviewed some of the aspects of a transport operation that must be studied *prior* to going into a job, contract or forecasted budget.

This chapter will be spent discussing the focal points for analysis that occur *current* to the work being done, that is to say, the creation and the effective utilization of the correct type of feedback system for a transport undertaking.

The first part of this chapter will be summarizing some of the basic requirements for any management feedback system used for effective decision making.

In the second part, the most useful types of operational and cost statistics relating to road transport are defined and discussed.

Finally, the points made in the second section are related to the seven different transport types used throughout this dissertation.

5.2 REPORTS AND RECORDS

When selecting what information should be recorded in a management control system, it is important to bear in mind the

objectives of the control system. The objectives should be as follows:

- (i) To show which jobs have been earning their keep
- (ii) To show which vehicles have been earning their keep
- (iii) To control the efficiency of an operation
- (iv) To control costs
- (v) To assist in the setting of future prices
- (vi) To measure the efficiency of vehicle maintenance
- (vii) To highlight the source of problems and opportunities in the above mentioned areas.

Any information that does not make a positive contribution to the above objectives should be discarded.

5.2.1 Basic information requirements

There are two essential requirements for all information collected for controlling purposes. These are:

- (i) *Relevancy* - information is relevant if it will make a contribution to an optimal decision, or, alternatively, is information worth knowing.
- (ii) *Accuracy* - information that is a true reflection of what actually did happen.

If these two requirements form the cornerstone of a management feedback system, the company is on the right track. Without this foundation, a company can only look forward to a high proportion of bad and costly decisions.

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